

Reply to Office Action of April 12, 2006

AMENDMENTS TO THE SPECIFICATION

Please amend the title of invention as follows:

STEERING WHEEL AND PRODUCTION METHOD THEREFOR

Please amend the paragraph beginning at page 1, line 4, as follows:

The present invention relates to a steering wheel for a vehicle, in particular, a steering comprising a ligneous surface material, and to a production method therefor.

Please amend the paragraph beginning at page 1, line 7, as follows:

In general, a steering wheel for a vehicle comprises a core and a surface material covering the core.

Please amend the paragraph beginning at page 1, line 9, as follows:

A ligneous surface material used for the steering wheel having this structure includes, for example, a laminated product in which a plurality of ligneous thin plates applied with an adhesive are laminated.

Please amend the paragraph beginning at page 1, line 12 as follows:

FIG. [[7]] 2 is a cross-sectional view showing a conventional ligneous steering wheel.

Please amend the paragraph beginning at page 1, line 13, as follows:

The steering wheel 13 shown in FIG. [[7]] 2 comprises mainly a core 14 which is a metal rod or a metal pipe and a surface material 15 covering the outer periphery of the core 14. The surface material 15 comprises a surface decorative material 16 which is a surface layer and a ligneous plywood layer 17 which is made by laminating ligneous thin plates and which is mounted to the inside of the surface decorative material 16. In the steering wheel 13, the surface

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materials 15 and 15, which are separately prepared, are joined, and the joining portions 18 and 18 between the surface materials 15 and 15 are on the outer periphery of the core 14, the surface materials 15 and 15 are adhered to the outer periphery of the core 14 via an adhesive layer 19. That is, the surface material 15 is attached on the core 14, via the adhesive layer 19. In addition, a coating film 20 is applied to the outer periphery of the surface decorative material 16.

Please amend the paragraph beginning at page 1, line 24, as follows:

For example, the steering wheel 13 is manufactured by the following processes. First, ligneous thin plates, on which an adhesive ~~are applied with an adhesive~~, are laminated and adhered to form, ~~and thereby~~ the ligneous plywood layer 17 ~~is prepared~~. After that, the ligneous plywood layer 17 is adhered to the surface decorative material 16, which is prepared in advance by pressing using a die while the ligneous plywood layer 17 and the surface decorative material are formed. Then, the end surfaces of the formed product comprising the ligneous plywood layer 17 and the surface decorative material 16 are cut such that the end surfaces ~~will be~~ are abutted and adhered, and thereby the surface material 15 having a semicircular cross section ~~was~~ is prepared. That is, in order to abutt and adhere the formed product, the end surfaces which make the joining portions 18 and 18 are cut, and thereby the surface material 15 ~~was~~ is prepared. The prepared surface materials 15 and 15 are arranged so as to cover the core 14. The joining portions 18 and 18 of the surface materials 15 and 15 are adhered, the surface materials 15 and 15 and the core 14 are adhered using the adhesive layer 19, and thereby the surface materials 15 and 15 and the core 14 are then integrated. After that, the steering wheel 13 is prepared by applying the coating film 20 on the surface of the surface materials 15 and 15.

Please amend the paragraph beginning at page 2, line 10, as follows:

~~As a~~ A steering wheel having a such a structure is shown, for example, ~~a steering comprising a ligneous sliced veneer as the surface decorative material is disclosed in~~
Unexamined Japanese Patent Application, First Publication No. 2001-30915.

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Please amend the paragraph beginning at page 2, line 13 , as follows:

However, when the steering wheel 13 is subjected to high humidity for a long time, because the adhesive used in the surface material 15 is thin and moisture permeates easily toward the interior of the surface material 15, in some cases, the moisture in causes the interior of the surface material 15 to swell and cracks are generated in the joining portion 18 between the surface materials 15 and 15, as shown in FIG. [[8]] 10. As a result, a problem arises in that the coating film 20 is split along the joining portion 18 and crack 21 is generated in the steering wheel 13.

Please amend the paragraph beginning at page 2, line 24, as follows:

As a result of diligent research for achieving the object, the present inventors have demonstrated that the generation of cracks of the abutted and adhered portions of the steering wheel can be prevented by using an adhesive sheet for adhering the surface decorative material and the ligneous thin plates, which is obtained by permeating an adhesive resin which has a moisture resistance in a base material.

Please amend the paragraph beginning at page 2, line 29, as follows:

That is, the present invention provides a steering wheel comprising a core and a surface material covering the core, and the core and the surface material are integrated, wherein the surface material comprises a surface decorative material, a plurality of ligneous thin plates, and adhesive sheets for adhering between the surface decorative material and the ligneous thin plate and between the ligneous thin plates; and wherein the adhesive sheet comprises a base material in which ~~an a moisture resistant~~ a moisture resistant adhesive resin ~~which has moisture resistance~~ is permeated.

Please amend the paragraph beginning at page 3, line 5, as follows:

In addition, the present invention provides a ~~production~~ method for producing a steering wheel comprising a core and a surface material covering the core, and the core and the surface material ~~are being~~ being integrated, the method comprising the steps of: laminating a surface

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decorative material and a plurality of ligneous thin plates via adhesive sheets in each of which an adhesive resin having a moisture resistance permeates in a base material; and adhering and forming the surface decorative material and a plurality of the ligneous thin plates in one process, and thereby the surface material is prepared.

Please amend the paragraph beginning at page 3, line 12, as follows:

In the steering wheel and the production method therefor of the present invention, the adhesive sheet, which is obtained by permeating an adhesive resin having a moisture resistance in a base material, is used. When the steering wheel is subjected to high humidity for a long time, moisture permeates into the ligneous material, such as the surface decorative material and the ligneous thin plate, and the moisture permeated in the ligneous material causes swelling. The adhesive resin having a moisture resistance can prevent such permeation of moisture. Thereby, the steering wheel and the production method of the present invention can prevent the generation of cracks at the adhered portions of the surface materials.

Please amend the paragraph beginning at page 4, line 17, as follows:

FIG. 1 is a cross-sectional view showing one embodiment of a steering wheel according to the present invention. The steering wheel 1 comprises mainly a core 2 and surface materials 3 and 3 which cover the outer periphery of the core 2. The surface materials 3 comprises a surface decorative material 4 which is a surface layer and a ligneous plywood layer 5 which is mounted to the inside of the surface decorative material 4 and which comprises laminated ligneous thin plates.

Please amend the paragraph beginning at page 4, line 23, as follows:

In the steering wheel 1, the surface materials 3 and 3, which are prepared separately, are abutted and joined. Joining portions 6 and 6 between the surface materials 3 and 3 are positioned on the outer periphery of the core 2 via an adhesive layer 7. That is, the surface materials 3 and 3 are attached to the core 2 via the adhesive layer 7. In addition, a coating film 8 is attached to the surface of the surface decorative material 4.

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Please amend the paragraph beginning at page 6, line 16, as follows:

The base material of the adhesive sheet 10 includes, for example, a Japanese paper and a nonwoven fabric. In particular, a nonwoven fabric made of chemical fibers is preferable for the base material. The chemical fibers are preferably polyesters and nylons. When the adhesive sheet 10 comprises a nonwoven fabric which is made of polyesters or nylons, the thickness suitable for preventing the moisture penetration is easily obtained. In addition, this adhesive sheet 10 has an extensibility such that the adhesive sheet 10 is not split during the production processes.

Please amend the paragraph beginning at page 6, line 23, as follows:

The steering wheel 1 having such a structure is, for example, prepared by the following processes.

Please amend the paragraph beginning at page 6, line 31, as follows:

In order to form the surface material 3 while integrating the surface decorative material 4, the ligneous thin plates 9, and the adhesive sheets 10, a forming die comprising an upper die 11 and a lower die 12, as shown in FIG. 4, is used. The lower die 12 comprises a cavity 12a having a shape which substantially conforms to the external shape of the steering wheel 1. The upper die 11 comprises a protruding portion 11a on the lower surface thereof, which contacts the upper surface of the lower die 12. The protruding portion 11a has a cross-section in a semi-circular shape which is smaller than the cross-section of the cavity 12a of the lower die 12. The upper die 11 moves toward the lower die 12, such that the vertex of the protruding portion 11a moves along the center line in the cross-section of the cavity 12a, as shown in FIG. 4.

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Please amend the paragraph beginning at page 8, line 9, as follows:

Then, the seam portions 6 and 6 between the surface materials 3 and 3 are treated, for example, are filed with a sandpaper. Then, if necessary, the obtained product is colored. After that, the coating film 8 is provided on the product by coating polyester resin, and thereby the steering wheel 1 is prepared.

Please amend the paragraph beginning at page 8, line 13, as follows:

The steering wheel 1 of the present invention comprises the surface material 3 in which the surface decorative material 4 and a plurality of the ligneous thin plates 9 are laminated via the adhesive sheets 10 comprising nonwoven fabric in which an adhesive resin having high moisture resistance is permeated. Therefore, when the steering wheel 1 is left in conditions such that the humidity is high, it is possible to prevent the moisture permeation in the ligneous thin plates 9, and thereby the generation of cracks at the joining portion 6 between the surface materials 3 and 3 is also prevented. In addition, since the adhesive sheet 10 comprising the nonwoven fabric is used for the steering wheel 1, the thickness of the adhesive, which is suitable for improving the moisture resistance of the steering wheel 1, is maintained. Furthermore, since the adhesive sheet 10 is positioned between the surface decorative material 4 and the ligneous thin plate 9 and between the ligneous thin plates 9 and 9, the strength of the surface material 3 is improved.

Please amend the paragraph beginning at page 15, line 1, as follows:

It is clear from Table 2 that the surface material and the steering wheel, which comprises the ligneous plywood layer comprising three thin plate plates made of ayus and four adhesive sheets, or the ligneous plywood layer comprising five thin plate plates made of ayus and six adhesive sheets, has superior impact resistance to that of the surface material and the steering wheel, which comprises the foam epoxy resin instead of the ligneous plywood layer.

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Please amend the paragraph beginning at page 15, line 7, as follows:

Compared with the surface material and the steering wheel, in which the urea resin adhesive was used to attach the ligneous thin plates, the surface material and the steering wheel comprising the adhesive sheets has superior moisture resistance and impact resistance.

Please amend the paragraph beginning at page 15, line 10, as follows:

It is also clear that moisture resistance is improved by using plural ligneous thin plates and plural adhesive sheets. Thereby, it is possible to prevent the generation of cracks at the seam portions. In addition, impact resistance of the surface material and the steering wheel was remarkably improved.

Please amend the paragraph beginning at page 15, line 25, line 2 as follows:

For example, in Examples, the steering wheel having a substantial semicircular shape was prepared using two surface materials having a semicircular shape. However, in the present invention, it is possible to prepare the steering wheel having a circular shape using two surface materials having a circular shape. In addition, it is also possible to use three or more surface materials having a curved shape, in order to prepare the steering wheel having a circular shape. Furthermore, in the Examples, two surface materials having a same shape each other are used to prepare the steering wheel. However, the present invention is not limited to this. For example, the surface material having an uneven surface, which is suitable for gripping and the surface material having a smooth surface may be combined to prepare the steering wheel.

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Please amend the paragraph beginning at page 16, line 3, as follows:

In addition, FIG. 7 shows one of examples of the steering wheel for vehicles which can be produced by the present invention. The steering wheel is produced by combining the surface materials 3 on the overall core 2, which has circular shape and comprises a bridge portion. FIG. 8 also shows the other examples of the steering wheel for vehicles which can be produced by the present invention. The steering wheel is produced by combining the surface materials 3 and leather covered portions 28 in which the core 2 is covered with soft resin and leather in that order.